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ABSTRACT

A series of studies carried out in Aberdeen, Scotland and Lancaster England is used to illustrate changing interests in the area of personality and learning. The early studies looked for general relationships, adopting a psychometric approach. Recent work has been focused more on the process of learning, particularly in higher education, and on attempts to understand differences in study methods and learning strategies in relation to individual differences in personality and cognitive style. (Author/MV)

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# FOREWARD

Professor Noel Entwistle spent some two months in Sweden last autumn at the invitation of this Institute and the R and D Unit of the Office of the Chancellor of the Swedish Universities. Most of his time was spent working with our research group and this provided valuable oppurtunities for discussion of our mutual interests in research on learning and understanding.

This report is a summary of a series of seminars given during his stay in Sweden and describes the outcome of twelve year's research related to personality and learning. It is included within this particular series, as a contribution to broader discussions about studying and learning in higher education, although it is not specifically concerned with the study of economics.

The members of our research group wish to express their gratitude to the Felix Neubergh Foundation and to the R and D Unit of the Office of the Swedish University for the financial support which made Professor Entwistle's visit possible.

Ference Marton

A series of studies carried out in Aberdeen and Lancaster is used to illustrate changing interests in the area of personality and learning. The early studies looked for general relationships, adopting a psychometric approach. Recent work has been focused more on the process of learning, particularly in higher education, and on attempts to understand differences in study methods and learning strategies in relation to individual differences in personality and cognitive style.

## INTRODUCTION

Cronbach (1957) drew attention to two scientific traditions in educational psychology. The one emphasized work on psychometric measurement and individual differences; the other was the experimental study of learning. At the time of Cronbach's article, and to a large extent since then, each tradition appears to have paid little regard to research emanating from the other tradition. To the learning theorist general processes of learning have been all important; to the psychometrist variations in product variables have provided the data for extensive computer analyses. Cronbach pointed out the possibilities of using aptitude treatment interaction studies in overcoming this undesirable separation between the two traditions. But, of course, ATI research is only one way of redirecting educational psychology. There are other, more serious problems, in the dominance of these traditions. Entwistle and Nisbet (1972) commented on problems in applying findings from educational research to classroom situations. The psychologist takes an educational problem and tries to interpret it in terms of theoretical constructs. He operationalizes variables in an effort to test precise hypotheses, but thereby creates findings in a language incomprehensible to the teacher.

The activities of the psychologist interested in understanding educational problems have also been criticized on more fundamental ground. Kallos and Lundgren (1975), for example, consider that psychologists have

focused on unacceptably narrow definitions of learning which commonly ignore not only the immediate social context of learning, but also "legitimate a far from non-controversal separation between means and ends in teaching, and a very narrow view of the social and economico-political objectives of teaching" (page 116). Svensson (1976) is critical of the whole approach to educational research which takes as its starting point the selection and measurement of variables. He argues that it is necessary to delimit concepts in relation to specific educational contexts and to provide evidence about functional, rather than incidental correlational relationships between important explanatory concepts.

Against this background, it is intended to trace the development of the author's interests in research into individual differences and learning, which began with studies on personality and academic attainment relying mainly on psychometric tests, and has developed towards a concern with individual differences in learning processes and learning strategies using a broader interpretation of acceptable data. In all this research the intention has been that the results should ultimately be of value to teachers or lecturers, either by providing factual information about factors related to academic success, or by drawing attention to the implication of important differences in learning processes or strategies.

## PERSONALITY AND ATTAINMENT

The starting point of this research interest was a study carried out in Aberdeen concerned with transfer from primary to secondary school in Scotland (Nisbet and Entwistle, 1966; 1969). Although the main focus was initially on the use of tests of cognitive ability in predicting attainment in secondary school, measures of personality and motivation were also given to an almost complete age-group of children in the City of Aberdeen (N = 2,995 at age thirteen).

In 1966 a review of the literature on personality and attinment suggested the existence of general relationships. Introverts were expected to be more successful in school or university attainment, while a non-linear relationship was predicted for neuroticism, following Eysenck's (1957) reasoning about the theoretical bases of these dimensions. Eysenck argued that an inverted-U relationship between neuroticism and attainment should be expected, with low performance being associated with both high and low levels of neuroticism. Using regression analyses of the Aberdeen data, however, there was no evidence of non-linearity on this dimension; stable children, both boys and girls, showed higher levels of attainment than children with higher scores on the neuroticism scale.

Contrary to expectation there was a U-shaped relationship between extraversion and attainment, but this proved to be a sex effect. Introverted boys, but extraverted girls, tended to have higher attainment scores (Entwistle and Cunningham, 1968). The possibility of other interactions led to an analysis in terms of ability level which complicated the picture even further. Among the more able boys, introverts were more successful, but extraversion was positively related to attainment among the less able boys (Entwistle and Welsh, 1969).

The next complication was the possibility of an age effect. Furneaux (1962) had shown that, among a small sample of university engineering students, neurotic introverts had the best examination results. Eysenck and Cookson (1969) then produced results which showed the consistent superiority of extraverts, both boys and girls, in a sample of 10-year-old children. But was this effect due to age or to type of education? A study at Lancaster found no clear indication of any change in relationships occuring when the same children were tested in primary or middle schools and then in secondary schools (Entwistle and Bennett, 1972), although there were indications in the data that variations in relationships between classes were larger then could be expected from sampling fluctuations.

These differences between classes suggested yet another intervening variable, namely teaching style. The most recent study at Lancaster has been examining the effect of teaching style in relation to personality and attainment. In the main report the effect of personality appeared to be slight, compared with the much greater influence of teaching style (Bennett, 1976). But the analyses were based on a definition of personality types derived from cluster analyses. In view of the accumulated evidence for the importance, and stability, of dimensions of motivation, extraversion and neuroticism in relation to school attainment, additional analyses using these dimensions to form sub-groups have now been carried out which are showing rather clearer personality effects, although the details have yet to be published.

## PERSONALITY, MOTIVATION AND STUDY METHODS

Parallel with these investigations at school level, a large-scale follow-up study has been carried out at Lancaster with a sample of university students. 1,531 students from seven universities were given a battery of tests and inventories in their first year (1968) and again in their final year. The main aim was to identify the characteristics of students, and in particular of successful students, in different disciplines. A full description of this study, and a similar one carried out in Aberdeen, is shortly to be published (Entwistle and Wilson, 1977). The Lancaster study attempted to predict degree results in terms of such variables as school attainment, academic aptitude, motivation, study methods, personality, social attitudes and values. The dimensions related to personality and values were also used to examine possible inter-disciplinary differences along the lines suggested by C.P Snow (1964).

> "Constantly I felt I was moving among two-groups-comparable in intelligence, identical in race, not grossly different in social origin, earning about the same incomes, who had almost ceased to communicate at all, who in intellectual, moral and psychological climate ... had little in common ... Literary

intellectuals at one pole - at the other scientists, and as the most representative, physical scientists. Between the two a gulf of mutual incomprehension - sometimes (particularly among the young) hostility and dislike, but most of all lack of understanding. They have a curious distorted image of each other. Their attitudes are so different that, even at the level of emotion, they can't find much common ground" (pages 2-4).

Taking from our sample 59 students majoring in physics and 111 students specializing in English and averaging the standard scores for men and women, the profile for physicists appeared to be almost a mirror reflection of that for the linguists. Although this does not allow us to suggest anything about their attitudes to each other, "mutual incomprehension" would not be surprising in view of the large differences shown in Figure 1 (taken from Entwistle and Wilson, 1977).

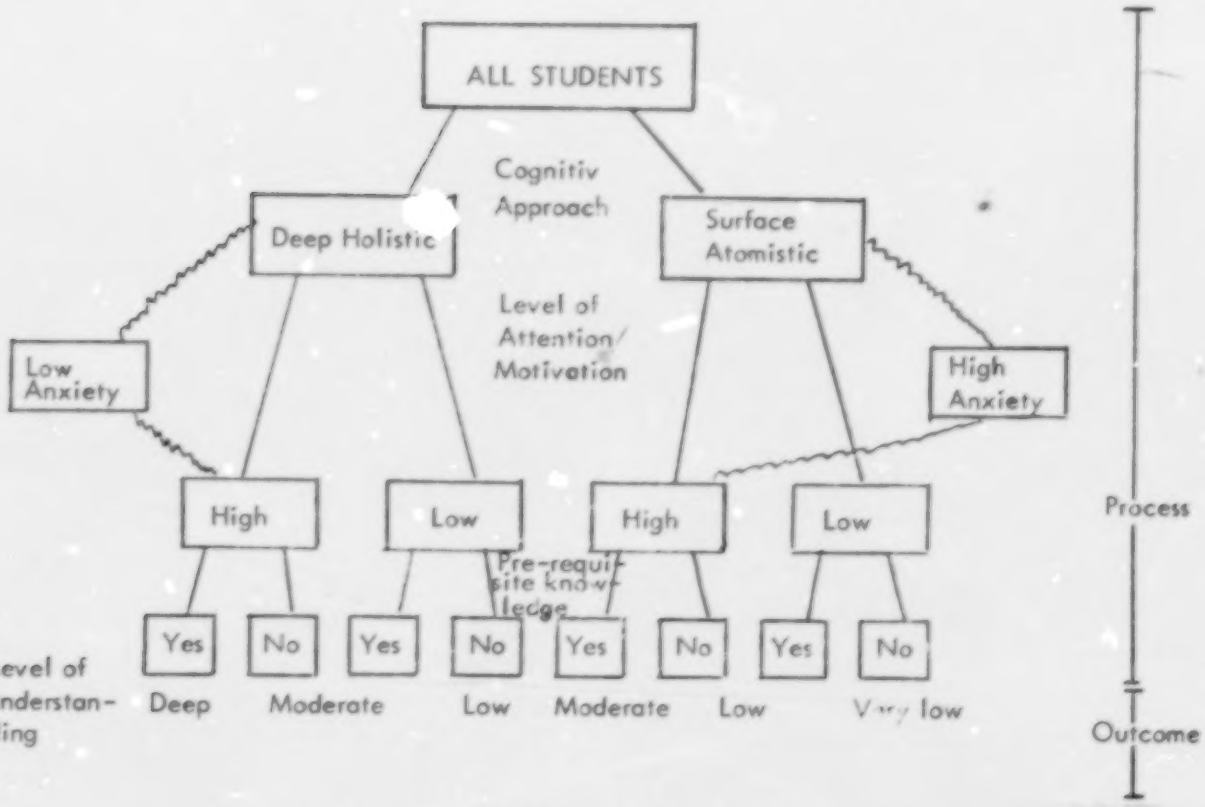


Figure 1. Profiles of mean mesa scores of physics and English students.

The second series of analyses attempted to predict degree result from measures obtained in the first year. Simple correlations were disappointingly low. Median correlations across six areas of study are shown in Table 1 for those variables with a consistent direction, and a statistically significant level, of relationship. Although the level of correlation is low, the findings are very much in line with previous studies in indicating the characteristics of successful students. It is, however, not particularly useful information. To say that a successful student will tend to work hard, have organised study methods, have higher aptitude scores and be introverted presents a spuriously uniform picture. The fact that even when these variables are used in a multiple regression analysis, the multiple correlation never exceeds 0.42 indicates the lack of predictability using this approach.

Table 1. Correlations with degree results.

| Variable | Correlation |
|---|---|
| First year marks | .55 |
| Hardworking (self-rating) | .28 |
| Study methods (inventory) | .25 |
| School attainment (A level grades) | .24 |
| Motivation (inventory) | .23 |
| Hours spent in independent studying | .19 |
| Verbal aptitude | .16 |
| Mathematical aptitude | .13 |
| Extraversion (Eysenck inventory) | -.12 |

Of course it makes sense that students should achieve success in different ways. Low ability can, for example, be counteracted by greater effort; it is only the correlational analysis which leads to the averaging out of such important differences. A more realistic approach is to use cluster analysis which allows students with similar profiles to be grouped together. In this way it becomes possible to identify successful students with different

patterns of scores on the defining variables. For example, two groups of successful students were described as follows.

> "Cluster 1 contained students with high 'A' level grades who were satisfied with their courses. These students had not had a particularly active social or sporting life, nor had they concentrated on developing aesthetic interests ... They were highly motivated and had good study methods. In personality they were emotionally stable and had high scores on theoretical and economic values, linked with a tendency towards toughminded conservatism. This combination of characteristics suggests a rather cold and ruthless individual, governed by rationality and spurred on by competition to repeated demonstrations of intellectual mastery."
>
> "The main defining features (of Group 6) were high scores on neuroticism and syllabus-boundness, and low scores on both extraversion and motivation. Their self-ratings were uniformly negative. They saw themselves as neither likeable not self-confident. They had no active social life and had few aesthetic interests. It is tempting to see these students as motivated mainly by 'fear of failure' and it is interesting to note the contrast between these students (who were also above average in degree results) and ... Cluster 1" (Entwistle and Wilson, 1977, pages 129-13 ).

As part of the follow-up study it was also possible to carry out semi-structured interviews with 60 university students (Entwistle, Thompson and Wilson, 1974). Again the difference between confident 'high-drive' students and the anxious self-deprecating students was marked in the student's comments. The contrast can be seen to the following extracts.

> "I enjoy doing exams. I think it's the challenge. You've got 3 or 4 hours and, somehow or other, you've got to get out of yourself enough of a pattern to knit something up, to knit 3 or 4 different garmets out of a tangle of wool. It's fun, when you know enough to make it fun. ..."
>
> "As soon as I look at the (exam) paper, I panic and think I can't do anything. Eventually, I get my nerve back and regain control. Occasionally, though, perhaps two or three times throughout the exam, I go all hot, and think I've got it all wrong. And one bad question really mucks me up" (pages 387-8, 390).

In this analysis students whose academic performance had improved since school were compared with a group who had done less well. One interesting difference was that the 11 'improvers' were all satisfied with the preparation they had had for university while still at school. Most of them indicated that teaching at school had been similar to university with lectures, small discussion groups, and independent study. In contrast, among the 21 students whose performance had deteriorated, 16 complained of "typical old 'ashioned school methods", "geared to getting you through exams", "spoonfeeding", and "dictated notes to copy out, and learn off pat".

It was also possible to collect interview comments from both staff and students on the same issue - why some students do badly at university. Almost without exception the lecturers presented a "hard-line" explanation which put the blame squarely on the shoulders of the students. For example, two typical comments were:

> "There are two kinds (of student) really - the downright indolent ... (or those who put efforts into other than academic work) and some who don't understand."

> "(I am familiar with the student who) is not very well motivated ... (and who) takes the courses largely because he likes other courses less. He may even be doing his degree on this basis."

But another lecturer perceived that the situation was paradoxical.

> "The main trouble is unwillingness to get down to work, but having said this, there is no doubt at the back of every instance of such unwillingness a paradox ... that at some time in the past, in order for a person to have got here presumably he had been willing, and something is going on which diminishes this willingness."

The comments of many of the students could be seen as providing a solution to that 'paradox'.

> "So often are students bored by uninspired teaching, or disenchanted by badly taught material. While university lecturers are undoubtedly knowledgeable, they are totally untrained in the art of communication ... The completely incorrect assumption is that anyone with a good degree will automatically be able to impart this knowledge to others."

By this stage in our research the advantages of combining psychometric data with interview data were becoming apparent, and with it the recognition that traditional approaches to educational research could, in themselves, not offer a full explanation of the way different students react to the same situation (Entwistle, 1974 a). For example, using item analyses of the study methods and motivation inventory, two of the factors were described as "disorganised and dilatory" and "cynical and disenchanted". Although summarizing relationships between items, these labels could also be taken as explanations of deteriorating academic performance. The comment of one of the students interviewed, who was not atypical provides a warning against too ready acceptance of such an easy explanation. A "label" can so easily become a "libel" (Entwistle, 1974 b).

> "I suppose the lecture technique was strange for a start. And, depending on who lectured, you didn't seem to gain an awful lot from lectures. Some were pretty useless. So, you acclimatise, and just don't bother going to all the lectures ... Then, as you start doing that, you start getting alienated, I suppose, from the system, and it doesn't work for you. This was true for the whole of the first year. I never managed to get completely involved in by work. And it was dissatisfying because, without being able to put anything in, I wasn't getting much out of the work, and it was just a viscious circle. I never broke out of it."

While it is, of course, probable that such explanations from students will contain an element of rationalization of poor academic performance, they do provide a necessary counterbalance. As the research worker is generally also an university teacher, it is all too easy to interpret findings from the lecturer's perspective. It is not always easy to throw off that way of looking at, say, the lecture situation. How many lecturers would, without prompting, recognize this view of university teaching?

> "University confronts the student with rigid intellectual authority: a body of teachers with a far greater degree of knowledge and expertise challenges and intimidates ..."

One important function of educational research is to challenge established ways of thinking, to force those involved in education to reinterpret familiar situations in a more sophisticated way. Lecturers in our interviews often provided over-simple explanations of student behaviour and attitudes (Entwistle and Percy, 1971, 1974) which in no sense did justice to the complex pattern of relationships between quality and style of teaching on the one hand, and student characteristics on the other.

The combination of psychometric analyses and interviews had helped to identify important differences between students. The issue of motivation was certainly not as simple as many lecturers implied. Although there was a consistent relationship between organised study methods and degree performance, it seems important for lecturers to consider the implications of the differing motivating forces identified in this study.

> "Some students are stable, confident and highly motivated by hope for success, while others are anxious, uncertain of themselves and haunted by fear of failure, and yet both groups are capable of high levels of academic performance. The interview data take the differences even further. Students of differing personality and motivational types not only tackle their academic work in different ways, but from their descriptions of their university experience, they evidently perceive themselves to be in differing environments" (Entwistle , Thompson and Wilson, 1974).

Another important difference between students is probably related to "fear of failure". Some students could be described as "syllabus-bound" using items similar to those described by Parlett (1970). For example, two of the defining items were

- I consider the best possible way of learning is by completing the set work and doing the required reading; and

- I like to be told precisely what to do in essays and in other assignments.

The opposite pole of this dimension - syllabus-freedom - contains such items as:

- I should prefer the set work to be less structured and organised.
- I am often involved in following up my own ideas when I am supposed to be doing set work.

The difference between students endorsing these opposite views about studying is reminiscent of Miller and Parlett's (1974) distinction between the "cue-seekers" and the "cue-blind" in relation to examinations. Perhaps these different descriptions are aspects of a more global variable - awareness - which indicates the extent to which students view themselves from a distance, seeing the whole situation in which they are involved, recognising the main aims of university, and distinguishing these from the day-to-day requirements of courses and degree structures.

## INTELLECTUAL DEVELOPMENT AND APPROACHES TO LEARNING

Although our follow-up study had provided what seemed important insights into study characteristics, the important link between teaching and learning could not be examined. The study had emphasized "product" variables, and looked only incidentally at the processes of learning. In evaluating the outcome of the longitudinal study at Lancaster, the practical value was described in rather pessimistic terms.

> "After considerable expenditure of financial resources and human effort, what has been achieved? In particular, will the results benefit higher education in any direct way? Unfortunately few pieces of educational research produce results which lead directly to action. In order to conduct research, concepts are used, or developed, which are several steps removed from the reality of people and institutions.

> The human situation is imperfectly described by the simplified frameworks which researchers are obliged to use. Results too often have the hollow ring of triviality and are consequently ignored, while subsequent attempts to demonstrate the "importance" of findings may read as an apologia for what might have been achieved" (Entwistle and Percy, 1974).

The trends exemplified in the research on personality and attainment were even more clear-cut in this study on students. The attempt at delineating general relationships was recognised as fruitless. There are such large differences between sub-groups that few relationships between psychological and educational variables can be expected to be uniform across them. The cluster analyses helped to establish useful explanatory patterns, while the interviews helped to place the findings in the broader social setting in which teaching and learning take place. It was also clear that the next stage in the research would have to reflect the different frameworks of interpretation offered by lecturers and students in explaining processes of teaching and learning. It seems, for example, to be of fundamental importance to clarify how students and staff interpret the main aims of higher education. What types of intellectual development are expected and how do students learn?

Lecturers had described what they saw as one of the main aims of higher education - to develop critical thinking. The precise way of describing this approach to learning differed from discipline to discipline, but it came close to what Ashby (1973) has described as post-conventional thinking.

> "The student moves from an uncritical acceptance of orthodoxy to creative dissent over the values and standards of society ... (In higher education) there must be opportunities for the intellect to be stretched to its capacity, the critical faculty sharpened to be point where it can change ideas." (Pages 147-9.)

If we are to help lecturers to achieve this aim, it is important to obtain detailed evidence about the processes involved. Can theories of learning, for example, help us to understand how students learn? Although there are developments in cognitive psychology which provide fruitful ways of conceptualising the teaching-learning process in higher education (Entwistle, 1975), these theories have still been developed in relation to other kinds of learning. Pooling the ideas of psychologists such as Ausubel, Broadbent, Bruner, Rogers and Maslow, may help to broaden a lecturer's perspective of his pedagogical role (Entwistle and Hounsell, 1975), but the weaknesses of extrapolating these theories into higher education soon become apparent. It is more promising to look for theories which grow directly from experiences with students.

One such study was carried out by Perry (1970) at Harvard and led to a scheme describing the intellectual development of students. He traced the growth of relativistic reasoning, from a primitive dependence on simple "correct" explanations to a recognition of the "pluralism which permeates the intellectual and social atmosphere of a pluralistic university". In the later stages of Perry's scheme students themselves describe the way their approach to studying has changed, the way their thinking has become more complex, relativistic and analytical.

> "I can read a book now, without regard for the pages ... I'm looking for ideas rather than plodding over the words ... I mean, before maybe I was reading, whereas now I ... tend to generalize the thing and get the main ideas and concepts ..."
>
> "The more I work here, the more I feel that what I'm trying to do is to become what you might call a detached observer of ... any situation ... One who can ... detach himself emotionally ... and look at the various sides of a problem in an objective, empirical type of way - look at the pros and cons of a situation and then try to ... analyze and formulate a judgement bringing into consideration what the other person would feel and why he would feel so."

Perry's findings seem close to the concept of "awareness" emerging from the work at Lancaster, but perhaps even closer to Marton's description of

"deep level processing" (Marton and Säljö, 1976) or Svensson's rather different interpretation of cognitive approach in terms of "holist" and "atomistic" indications (Svensson, 1976). One of the weaknesses in Perry's study was his exclusive reliance on the subjective reports of students. The work of Marton and his colleagues in Gothenburg combines the introspections of students with the outcome of a learning experiment, and in more recent studies with study activities in specific courses (Svensson, 1976) and with the effects on learning of various experimental conditions (Säljö, 1975; Dahlgren, 1975). The deep-level approach involves looking for the main ideas and arguments, actively evaluating them in terms of the evidence presented and drawing on previous knowledge and experience. (It is important to recognise that students are not categorized as deep-level processors as such. They simply are seen as having used that approach on that occasion.) This cognitive approach can also be recognised by the student's awareness of the links between academic learning and real life situations, which allows the student to conceptualize the learning tasks he meets in terms of their underlying meaning. In contrast the "surface level" approach focuses on the task situation itself, asking what has to be done to meet the academic requirements. As a result students who adopt a surface approach tend to look at learning in an atomistic way, looking at the parts, rather than the message underlying the specific ideas and factual information.

An SSRC research programme just beginning at Lancaster has been designed to bring together the previous findings on student characteristics with the ideas being developed in Gothenburg. The main question being posed is whether deep-level processing can be viewed as a relatively stable, though developing, characteristic of the individual, rather than as the individual's response to a specific situation. Of course, the difference implied in this approach is no more than a matter of emphasis. The student will of course react to the situation, but he will also bring to that situation certain predispositions towards interpreting learning in a characteristic way. The question we are interested in is whether deep level processing involves, besides

a cognitive approach, also identifiable cognitive skills, and also whether there are different ways of reaching a deep level of understanding, implying the existence of cognitive styles which in turn might reflect differences in personality.

This way of thinking has been influenced by the work of Pask (1976 a, b) and Witkin et al. (1977). Pask has described the different learning strategies adopted by students who are asked to work through realistically complex academic topics, following a hierachical arrangement of sub-topics. Pask uses a computer to record the paths of exploration and learning students take. Although the form of presentation imposes constraints on a student's approaches to learning, there is still sufficient freedom for distinct differences to be recorded. In his earlier work Pask made the simple distinction between "holists", who prefer to explore several topics in a rather unsystematic manner before learning the simpler ones, and "serialists" who tend to tackle one topic at a time. More recently (Pask, 1977) he has identified various learning pathologies and also sub-divisions within the two main strategies. Moreover he has suggested that these strategies, which are specific to the learning situation defined by his apparatus, are indicative of more general learning styles of "comprehension" (holistic) and "operation" (serialistic) learning. These terms appear at least at a descriptive level, to be similar to the cognitive approaches described by Marton. Comprehension learning could be taken to imply an orientation towards the deep level meaning of the topic presented, while operation learning carries with it the implication of excessive reliance on the surface definition of the learning task.

One of the most important of Pask's findings relates to matching and mismatching learning strategies and materials. Students who tend to adopt comprehension learning find it very difficult to learn from materials designed for serialists, while "holistic" materials prove difficult for serialists. These difficulties might be anticipated as one consequence of differences in cognitive style. Witkin has used the Embedded Figures Test to define perceptual diffe-

rences in terms of field-dependence/field-independence. People who readily distinguish figure from "ground" are said to be field-independent and Witkin has recently argued (Witkin et al., 1976) that such people also tend to adopt an "articulated", as opposed to a "global", way of thinking. Moreover he has argued that while field-independent students should be able to learn effectively from unstructured materials (by imposing their own structure on them) field-dependent students would be more reliant on a clear structure being built into the materials. He also presents evidence that field-independent lecturers tend to teach in a structured way, while field-dependent lecturers prefer a less articulated form of presentation. On the other hand it appears that field-dependent students prefer the unstructured teaching approaches of field-dependent lecturers.

Witkin's descriptions of field-independent students also indicate an introverted personality, in the sense described by Jung (1938). This review of the literature thus led us to look (see Entwistle, 1977), in pilot studies at Lancaster, for student characteristics which might help us to understand the different cognitive approaches adopted by students when asked to read an academic text. The description of deep level processing implies the existence of intrinsic motivation towards that task, but would our "fear of failure" students, or those who showed a syllabus-bound attitude to studying, tend to conceptualise the task in terms of its surface properties and concentrate on the "safety" of fixing certain facts or ideas in their memory? It seems rather probable. In the earlier research introverts were found to have higher levels of academic performance than extraverts, and to have more organised study methods. Now it is necessary to discover whether they also adopt more articulated, but also more individualistic, ways of thinking which might affect either their cognitive approach or the particular way in which their approach is exhibited.

## COGNITIVE APPROACH AND INDIVIDUAL DIFFERENCES

In the pilot study our first step has been to modify Marton's methodology. Individual interviews were essential in developing ideas about different levels of processing, but a shorter and simpler approach is necessary if we are to identify

the correlates of different learning strategies. We are thus developing a questionnaire variant of Marton's technique and an inventory covering study attitudes, personality and learning strategies.

Our basic method so far has been to ask students to read an article written for the intelligent layman which contains an argument and supporting evidence. The articles we have used, so far, have been "The Mental Differences between Children" by Burt (1971) and "The Expanding Universe" by Hoyle (1950). The students are put under moderate time pressure. After completing the reading students carry out unrelated tasks taking some 15-20 minutes. In the early sessions this task was either Witkin's Embedded Figures Test (Witkin et.al., 1971) or the "Uses of Objects" Test (Hudson, 1966), while in later sessions we also used the Categorizing Test from the Family Relations Test being developed in Bergen by Raaheim and his colleagues (Bengtsson and Raaheim, 1976). This test measures divergent thinking, but with realistic limitations on a student's freedom to produce divergent suggestions.

The next step is to ask the students to complete the questionnaire in which the first question asks for a summary of the author's argument. Short-answer questions are then used to see how many of the main steps in the argument are remembered separately, and also whether facts which are central to the argument, and those which are incidental to it, are remembered equally well. The final question asks the students to report their introspections about how they tackled the article with a minimum of written guidance about what form the answer should take. The main problem in using this technique lies in the critical importance of wording the questions correctly. By now, however, we are confident that it will be possible to identify deep and surface processors by questionnaire, although not with as much certainty as the original interview method provides.

After answering the questionnaire, students are asked to complete an attitude inventory which contains Likert-type statements on a five-point scale relating to study methods, motivation and personality. The inventory also contains items designed to be indices of comprehension learning, relativistic reasoning

and deep and surface level processing. A series of vignettes describing reasons for entering higher education and typical reading strategies are presented at the end of the session.

In reading the student's own descriptions of their approach to the article, the distinction between deep and surface strategies is generally clear. Out of a total of 88 questionnaires analyzed to date only 20 were unclassifiable. In this sample drawn from first and second year university and college students some 25 per cent showed the characteristics of deep-level processors, while 52 per cent adopted surface level strategies.

Although it was possible to identify deep and surface levels with some confidence, additional distinctions emerged. As an example consider the comment of one student who was making active use of his own experience in tackling the Burt article.

> "I read more slowly than usual, knowing I'd have to answer questions, but I did not speculate on what sort of questions they'd be. I was looking for the argument and whatever points were used to illustrate it. I could not avoid relating the article to other things I'd read, past experience and associations, etc. My feelings about the issues raised made me hope he would present a more convincing argument than he did, so that I could formulate and adapt my ideas more closely according to the reaction I felt to his argument. As it was I found it rather unstimulating though my anticipation of interest was sustained."

We can distinguish this comment, perhaps from a field-independent introvert, from the more extraverted responses of deep-level processors who stress the attention they pay to the argument, but seem to make few cross-references to previous knowledge or personal experience. The surface processors may adopt their approach as part of a general attitude to academic work, or as a specific response to an article where they lack necessary pre-requisite skills or information. By choosing articles of general interest and at an appropriate level of difficulty, however, most of the surface processors are showing a characteristic attitudinal response.

Between the deep active and the surface groups there is, in addition, an intermediate group of students who apparently intend to understand the author's meaning, but use a passive approach which leaves them with a general impression of the meaning, but with less ability to recall the supporting evidence. This seems to indicate a lower level of attention, or application, in trying to understand the text. Thus in investigating the relationship between learning outcome and cognitive approach, several problems remain in deciding how to conceptualize and categorize the different instances of outcome and process within the data.

The first question is whether outcome and process should be separated. Svensson (1977) has argued for the unity of knowledge and skill and his concept of cognitive approach depends on that unity. A deep level of understanding, at least of this type of material, can only be reached by recognising the facts/conclusion relationship in the text. To recognize the particular facts/conclusion linkage in a text demands both an orientation towards the underlying meaning of the text and an active approach which relates the facts to the argument and conclusion. Thus if a student demonstrates this type of understanding, he must have adopted a holistic approach. Following this line of reasoning, deep level understanding of the text can be taken as the best indicator of a holistic approach. On the other hand there will be students who adopt a holistic approach, in terms of their introspective descriptions, but fail to reach a full understanding of the meaning, for lack of either attention or previous knowledge, or because of inaccurate introspections. Thus although there is a logical necessity for a student to have adopted a holistic approach in reaching a deep level outcome, the empirical relationship between process and outcome will not be exact. Deep level understanding necessarily implies a holistic approach, but not vice-versa.

In using the concept deep level processing Marton (1974 a) has deliberately kept process separate from outcome. This allows the concept to be more readily understood and identified in other contexts, where the nature of the outcome may be different. "Freeing" the concept of cognitive approach from outcome seems to have advantages in generalizability, but there seems to be no objection to

using outcome as an indicator of process where the relationship between process and outcome has the logical necessity described above. It certainly helped in the Lancaster pilot data to use outcome in identifying "deep level processors" but at that time it was difficult to see how it could be justified.

Another problem in categorizing instances of deep level processing depends on how many indications of that process need to be given. Marton has used a disjunctive approach, so that any one of c series of main indicators will lead to a student being categorized as adopting a deep approach. Thus a student who indicates activity in relating facts and argument, or a tendency to develop individual criticisms, or an orientation towards the underlying meaning will be classified as exemplifying a deep approach. There could thus remain interesting differences (Marton, 1975) in learning strategies within this category and similarly different reasons for students failing to adopt this approach. To date the evidence seems to be that the concept of cognitive approach defined in the disjunctive way has considerable explanatory power, but it would also be interesting to examine apparent differences within it. Figure 2 indicates some of these components and possible inter-relationships in terms of a heuristic diagram (see page 21).

Recent research at Gothenburg (Fransson, 1977) indicates the effects of anxiety and motivation on both cognitive approach and learning outcome, but these relationships do not carry the logical strength of those indicated by the unbroken lines shown in Figure 2. In the Lancaster pilot study the group showing a deep approach but low attention were identified as "deep passive" as they did not actively interact with the text, but the surface approach, low attention group was only indicated by a very low level of understanding of both facts and message. Svensson (1977) has presented clear evidence of variations in level of effort among students variations in level of effort among students adopting an atomistic approach in their normal studies and the close relationship which the combination of cognitive approach and hours spent studying has with examination results.

Another part of the pilot study at Lancaster involved developing an inventory to measure student characteristics which might be associated with cognitive

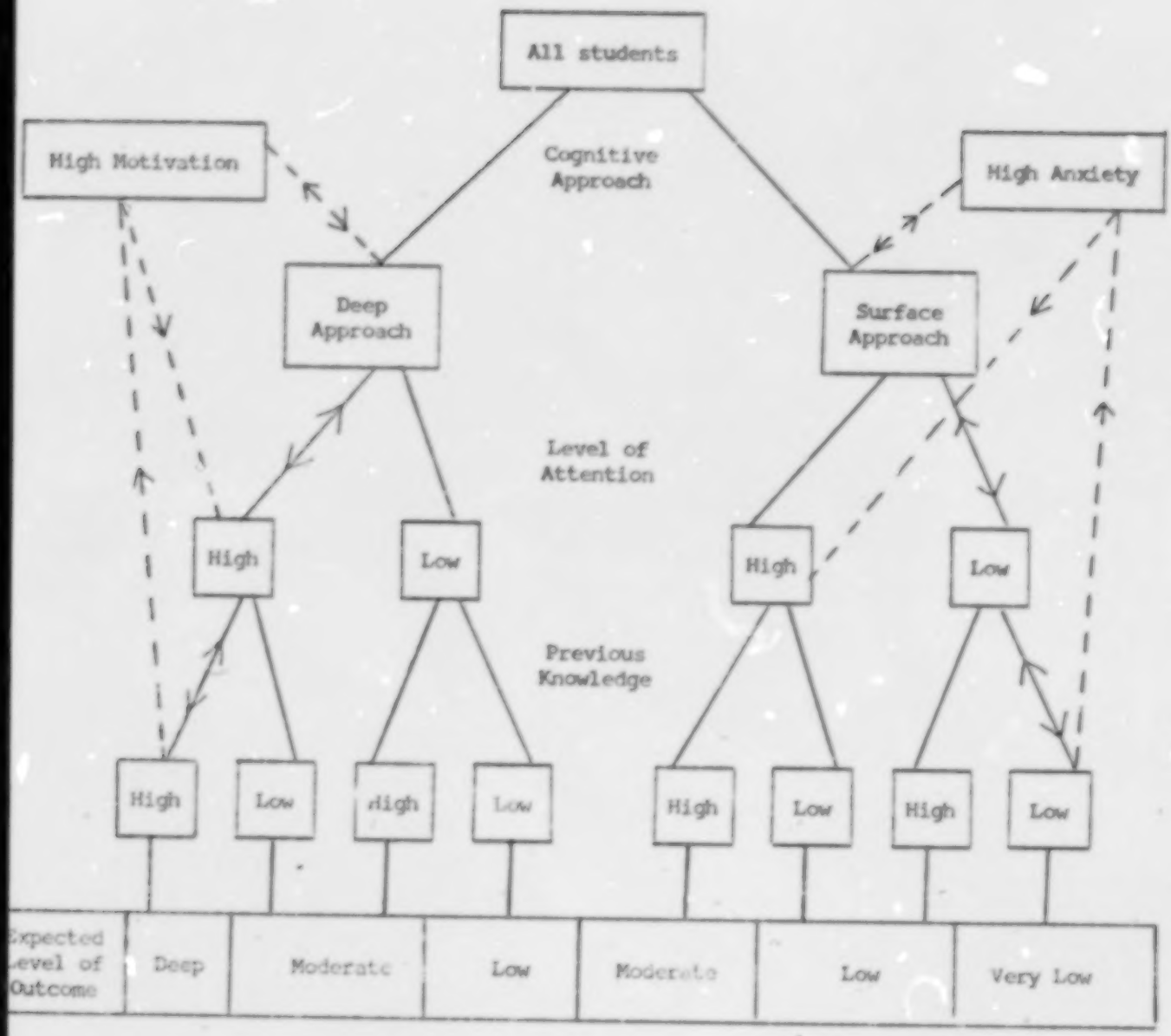


Figure 2. Approach to learning and level of outcome.

approach or learning strategies. Factor analysis of the pilot inventory has led to a modified version which contains the following scales: organisation and planning of study activities; determination to be a successful student, fear of failure; syllabus-freedom; casualness; extraversion; neuroticism; tenderminded-ness and radicalism. In the pilot study separate scales were used to describe deep-level and surface-level approaches, as well as relativistic reasoning, comprehension learning and cognitive flexibility. Factor analyses have, so far, failed to indicate any clear differentiation between these concepts and so a large single scale of surface level/nonrelativistic reasoning has been retained in the second version.

Items in the first pilot version were used to examine the characteristics of students who, from their questionnaire responses after reading the article, could be identified as either deep or surface processors. Initial indications are that the deep-level approach is associated with rather higher divergent thinking scores, and a tendency towards radical, non-dogmatic social attitudes and an introverted personality. A discriminant function analysis using 26 items from the inventory predicted membership of the deep and surface groups with 93 per cent accuracy. The items appearing first in the step-wise analysis indicated radicalism and introversion, but the next six items had a clear conceptual connection with either relativistic reasoning or cognitive approach.

- Lectures should try to show students the right way to think about their subject
- Often I find I have to read things without really understanding them.
- When I'm reading I try to learn facts which might come up in future exams.
- I don't believe in challenging lectures' ideas, they are better informed than I am.
- I like to learn things systematically, one topic at a time.
- Academics seem to delight in making the simple truth unnecessarily complicated.

As the discriminant function analysis was based on only 58 cases, the pattern of items cannot be taken as strong evidence of what underlies the cognitive approach identified in the questionnaire. But if similar patterns persisted, it would be necessary to query the extent to which the deep level approach is a reaction only to a particular learning context. The items here might be taken to imply, among surface level processors, a lack of certain important prerequisite intellectual skills which would prevent them adopting any more than the "survival" strategy of surface level processing.

The research programme at Lancaster has been designed not only to focus on the characteristics of deep and surface level processors, but also on the effects of different departments on how students come to view their subject - an area which could be described as intellectual socialization. It will clearly be fruitful to examine qualitatively different levels of understanding of fundamental concepts of students in different departments, and also the way these students interpret real-life problem situations presented to them. Such information would provide some indication of what intellectual skills and knowledge the students will take away with them, with some probability of these having a lasting effect on their professional and private lives. But the major difficulty will be to find concepts which describe important differences between the intellectual "climates" of different departments. No simple measurement device could be used. It would be necessary to collect a wide variety of data ranging from entry qualifications of students and distributions of degree results, to examples of examination papers and assessment exercises, and the interview comments of both staff and students. Combining such a variety of different data presents serious problems, but the approach described by Svensson (1976, 1977) by which concepts can be derived by iterative examination of instances, seems to be ideally suited to solving this problem.

The research reported in this article represents the work of many individuals, members of research groups or students, with different views about research, but the overall pattern shown in these studies reflects the changing conception of research mentioned in the introduction. The studies on personality and attainment, and also on studying and learning, show a progressive shift from exclusive reliance on psychometric approaches to a recognition both of the value of other forms of data and of the necessity to relate findings into the wider social setting in which learning takes place.

Although much of this research could still be seen as belonging to the positivist tradition, aspects of it have drawn from more humanistic philosophical traditions. The research designs of both the completed studies described above relied on a traditional view of educational research, one which could be seen to follow the hypothetico-deductive approach. But as in most educational research studies this paradigm is an ideal rather than an actuality. Perhaps we should consider seriously why this ideal is so rarely achieved? Is it because the social sciences are still in their infancy? Or should the social sciences look for an entirely different model of research strategy?

Before tackling these questions we must be sure that the model is, in fact, followed in other sciences. There are certainly some philosophers of science who see the model as a rationalisation of real research activity, rather than as a description of it, even in the physical sciences. For example, Popper (1976) has shown that induction from repeated positive instances can never prove a theory to be wholly true. Any single future negative instance could disprove it.

Popper describes an iterative model in the growth of scientific thinking in which tentative theories are refined through error elimination, but never perfected. Within this view science progresses by demanding that theories be falsifiable and that there should be a process of conjecture and refutation.

> "The way knowledge progresses, and especially our scientific knowledge, is by unjustified (and unjustifiable) anticipations, by guesses, by tentative solutions to our problems, by conjectures. These conjectures are controlled by criticism; that is by attempted refutations." (Popper, 1963, p VII)

These conjectures are, of course, also controlled by empirical test. But the process of putting forward a tentative theory creates a problem for Popper, while being at the centre of Polanyi's description of scientific method.

> "The first theories - that is, the first tentative solutions to problems - and the first problems must somehow have arisen together." (Popper, 1976, p 133)

> "It is of the essence of the scientific method to select for verification hypotheses having a high chance of being true." (Polanyi, 1958, p 30)

For Polanyi falsifiability is less important; theories with broad explanatory power can survive negative instances intact. It may be the evidence, not the theory, which needs to be reinterpreted. Polanyi also rejects the normal idea of scientific objectivity and the mechanical procedures often implied by the logic of scientific discovery.

> "The discovery of objective truth in science consists in the apprehension of a rationality which commands our respect and arouses our contemplative admiration; ... such a discovery, while using the experience of our senses as clues, transcends this experience by embracing the vision of a reality beyond the impression of our senses, a vision which speaks for itself in guiding us to an ever deeper understanding of reality." (Polanyi, 1958, p 5-6).

Polanyi stresses the importance of creative imagination in physical science: the process of scientific discovery is, in fact, seriously misrepresented by the model of a hypothetico-deductive process. Our concern in education should not be that we fail to follow this model closely, it should rather be that we have produced few theories which could fit Polanyi's description of contemplative awe.

If physical science relies heavily on intuition for its major breakthroughs, as Polanyi argues, it should be found even more strongly in the social sciences. Polanyi's ideas of personal knowledge and empathetic theorizing, supported, but not dominated, by empirical testing should provide a more appropriate model for educational research. Certainly Bantock (1965) was severly critical of attempts by social scientists to ape the physical sciences in tackling their research problems.

> "The understanding of social phenomena involves a qualitatively different approach to that needed with natural (phenomena), in that such understanding implies something more than simple external observation: it necessitates at least an imaginative projection into what the phenomena concerned mean, a meaning which can only come fully from inside the activity to be studied."

Not only is it important to try to understand meanings within a social setting, it is also important to develop concepts in education which emerge naturally from these situations, and are not imposed from outside by applying theories developed in other contexts and for other purposes. In short, a grounded theory approach should be useful.

> "Pedagogically speaking, teaching has to be looked upon as an integral part of the educational system. The starting point (of research on teaching) is thus the system, and not the psychological processes within the individual learner or teacher. From a theoretical point of view this will lead to a set of concepts not derivable from psychology, and to a refutation of logical empiricism as the sole scientific basis for educational research."
> (Kallós and Lundgren, 1975, p 117)

The implication of a single starting point to educational research may not be acceptable, but in terms of the argument being developed here, the rest of the comments is apposite. Educational research worker should certainly be expected to take into account, in interpreting their findings, the constraints or frames (Dahllöf, 1971), imposed by social situations. But research workers cannot explain the whole educational process in a single study: they have

to have a "focus of convenience" for their work. Thus in educational research there will be a selection of problems within a set of frames, such as that shown in Figure 3. In selecting a problem, methods of data collection and analysis, and in interpreting the findings, there will be necessary, and to some extent valuable, subjectivity. Valuable insofar as this subjectivity is directed towards imaginative and empathetic understanding of the educational situation, but dangerous insofar as the research worker is unaware of the frames affecting his decisions. (Some of these frames are also shown in Figure 3.) The research worker may thus focus his attention on broad or narrow aspects of the educational process, and interpret that process in terms of his own conception of the nature of man.

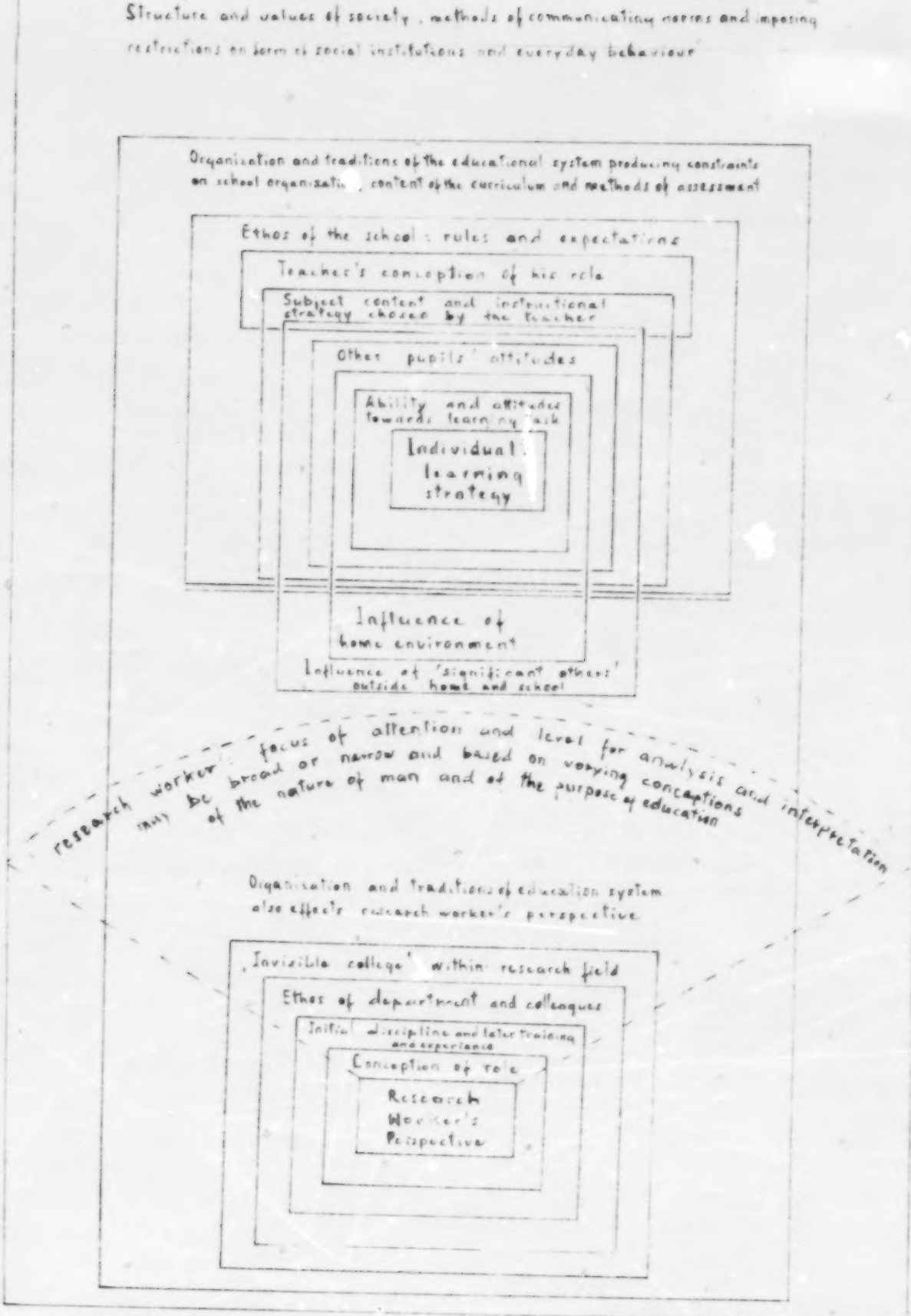
Structure and values of society, methods of communicating norms and imposing restrictions on form of social institutions and everyday behaviour
Organization and traditions of the educational system producing constraints on school organization, content of the curriculum and methods of assessment
Ethos of the school: rules and expectations
Teacher's conception of his role
Subject content and instructional strategy chosen by the teacher
Other pupils' attitudes
Ability and attitudes towards learning task
Individual learning strategy
Influence of home environment
Influence of 'significant others' outside home and school
research worker's focus of attention and level for analysis and interpretation may be broad or narrow and based on varying conceptions of the nature of man and of the purpose of education
Organization and traditions of education system also effects research worker's perspective
'Invisible college' within research field
Ethos of department and colleagues
Initial discipline and later training and experience
Conception of role
Research Worker's Perspective

Figure 3. Different levels in the analysis of educational processes.

To what extent has the research at Lancaster responded to demands for a new approach? To the outsider it may seem that it has yielded ground only slowly, but this probably reflects a belief that no single approach is ideal. There is a danger in abandoning traditional approaches altogether: a "belt and braces" strategy seems safer. Perhaps what is mainly lacking in the Lancaster work is a fully systematic analysis of interview data. The approaches followed in Gothenburg, as illustrated most recently in the delimitation of the concept of study skill (Svensson, 1976), provide interesting possibilities to explore in the new research programme. But are we justified in continuing to look for explanations in terms of individual differences, using questionnaires and inventories? Is there any rationale for clinging on to the old, familar psychometric garments? Is the use of pre-defined variables of any kind justified?

The argument against pre-defined variables hinges on the need for concepts to emerge from the specific educational context. However, many of the variables used in research into higher education are already part of that context, for example, measures of previous school attainment, degree results and specialism. Other background variables can also hardly be questioned, for example, sex, parents' education, number of siblings in higher education, and so on. Other variables have a clear meaning, even if there are measurement problems, for example, hours spent in studying. Even variables such as study methods are by now fairly well defined: most inventories contain a familiar core of items relating to organisation and planning. Of course inventories are open to response sets of various kinds, but gross distortions can readily be detected from self-rating scales. Cluster analysis has proved particularly useful for this purpose. (See, for example, cluster 1, Table 2 in Entwistle and Brennan, 1971, p 272 which almost certainly contains some "humourists" who were consistently faking "good"). The scores are also made up of combinations of different items, but if the scale has been clearly defined and properly developed the "meaning" of the same score will, in fact, be sufficiently similar at least for making group comparisons.

The arguments against measuring individual differences at all can be either humanist or "contextualist". Is it wrong to characterize an individual in terms of scores on various dimensions? Of course such a procedure produces an incomplete and static view, which cannot do full justice to an individual's uniqueness. But if we accept the dictum that a person is to some extent like every man, to some extent like some other men, and to some extent like no other man, the search for group similarities makes sense. However, there is the other basic problem of consistency. Do people exhibit sufficient consistency in behaviour across different situations to make individual traits worth measuring in any one situation? Psychometricians make no claim that behaviour is totally consistent, indeed an important part of their work is to test the stability of traits. Behaviour does vary between situations, but the main assumption underlying the use of trait measurements is that the within individual variations are generally smaller than the between individual variations. For some of the basic personality variables such an assumption seems to be fully justified by the evidence. Again, whether we choose to define personality in terms of traits or not, the complexity of human behaviour forces us, even intuitively, to categorize, to organize, and to anticipate regularities in other people's behaviour. The psychometric approach carries on this search for simplifying regularities, but in a systematic and quantitative manner. Searching for similarities, and comparing differences is an essential part of research, and recognisable consistences do emerge. As Bronowski (1965) has put it:

> " If a man does not want to be law-abiding (in the nomothetic sense), very well, then it is time to ask him the rude but searching question, 'Do you want to be lawless?' You refuse to be predictable as an engine is, or an animal; do you aspire to be unpredictable? And if so, are you unpredictable to yourself, the actor, as well as to me, the spectator? Do you base your claim to be a self on the proud assertion that your actions are arbitrary? (No).... a self must have consistency, its actions tomorrow must be recognisably of a piece with the actions carried out yesterday." (Bronowski, 1965, p 13-15)

This argument is interesting and challenging, but cannot provide a total defence of positivistic approaches to research. We could parallel Bronowski's inquisition by addressing ourselves to posivitist social scientists. Your scientific

predictions are based on theories, on measurement and on the assumption of causality. How secure are your theories? How accurate are your measures? And to what extent does purposeful behaviour contradict ideas of causal explanation? It can be argued that where physics requires the Heisenberg uncertainty principle, social science needs at least a triple uncertainty principle (Entwistle, 1974 a).

Perhaps the main weakness in using psychometric approaches is that the relationships found between variables provide only weak explanations. The dynamics of the relationships and the relative importance, or functionality of the different associations are difficult to understand. The approach can take us only so far, and in educational research there is now a growing frustration with its limitations. It is necessary to explore the use of less "hard" evidence and less automatic procedures of analysis. Using fairly open interviews often provides important insights into human behaviour, but the main difficulty is in convincing other research workers of the validity of those insights. How can interview data be made to yield trustworthy evidence? The usual approach has been to make categories, and the advice in the text-books is that these categories should be decided in advance to allow statistical comparisons to be made. For factual questions this is certainly the best approach, but interviews can also be used in an entirely different way to explore a relatively unmapped research area. Exploratory interviews are commonly used, but the data they provide are rarely submitted to extensive, systematic analysis. There are formidable problems in analysing even semi-structured interview transcripts, but the iterative procedure used by Marton (1974a,b) in identifying the concept of deep/surface-level processing, and described by Svensson (1976), provides a powerful, if laborious, analytic tool.

The general approach involves reading through transcripts from some 30-50 respondents repeatedly, trying to decide what are the main differences and similarities in the responses. Of course, there must be a guiding hypothesis to focus this initial search. In the Gothenburg studies it has been the idea

of qualitatively different learning outcomes. The differences in outcome provide the most striking and clear-cut aspect of that data. These differences can then be categorized, and explanations of those differences sought. By condensing the responses on the other questions into "short-hand" descriptions, either as summaries or as a series of symbols, patterns of similarities can be detected. This will generally mean searching for fairly general concepts and categories which have a high explanatory value. This search will almost inevitably be iterative; the most useful conceptualisation may not be the most immediately obvious.

It should be clear from this description that these systematic approaches to data reduction are essentially scientific, even if they involve subjective interpretation at an earlier stage in the research process than is usual. This subjective involvement is, in fact, a great strength. The researcher is kept close to the data and in full control of the analysis. He is free to test hypotheses against instances of tentative concepts and can make full use of empathetic imagination in deriving explanations from the functional relationships which emerge. The researcher is in a much better situation to describe the overall experience of participants than when he uses more traditional methods. Even the subjectivity of the concepts can be tested. Given the same theoretical background, considerable similarity of concepts drawn from the same interview data can be demonstrated (Svensson, 1977) and even differences in these conceptualisations can be fruitful in understanding the phenomena (see the earlier discussion on deep-level processing and holist approach).

The case has now been argued for both psychometric approaches and interview data. Which approach should be used, and for which purposes? If there is a general rule, then it would be to opt for a mixed economy, but it is still essential to use each approach to its best advantage. Where the research area is not well-researched, or where the dynamics of processes need to be understood, interview, or observational, approaches are more appropriate. But interviewing and detailed analyses are time consuming and keep sample size low. Often it is necessary to know more about the extent to which relationships or expla-

nations can be generalized to other sub-groups of the population. Once key concepts have been identified, it is probable that questionnaires or inventories can be used to explore the applicability of those concepts to other contexts. There may often be no other choice. It would rarely be practicable to repeat extensive interview studies in a wide variety of different settings. Survey approaches can also be used to identify extreme groups, which may make the search for important differences in the analysis of interview data much easier.

The way forward in educational research may well lie in the imaginative interplay of interview and questionnaire data, avoiding dogmatic assertions about the merits and demerits of each approach. Individual researchers may well feel happier in one or other paradigm and prefer one particular way of viewing man and his behaviour, but it is also important to recognize the limitations created by being a human being on the one hand, and trying to be a scientist on the other. Part of the objectivity necessary for a social scientist depends on a recognition of his inevitable subjectivity. We should expect and welcome different types of explanation and theory, exploring this pluralism by a recognition, and acceptance, of uncertainty and relativism. Jaffé (1972) quotes Jung as saying:

> "We shall probably have to resort to a mixed explanation, for nature does not give a fig for the sanitory neatness of our intellectual categories of thought." (p 32)

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